Abstract

Title: **Surface Area, Volume, Mass, and Density Distributions for Sized Biomass Particles**

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OBJECTIVE

This project seeks to characterize the shape and mass for biomass particles. Individual biomass particles are being characterized for their external surface area, volume, and drag coefficient/mass ratios. Analysis methods are being employed using shape and drag information to calculate mass and density distributions for these particles. Results of these measurements and analyses are being validated by independent mass measurements using a particle weighing and counting technique. Cofiring of biomass and coal has been identified as a promising way of reducing net CO_2 emissions with minimum modifications in the existing technologies. The successful accomplishment of the above objectives will provide detailed particle property data required for developing improved combustion kinetic models for technologies involving cofiring of coal and biomass feedstocks.

ACCOMPLISHMENTS TO DATE

In this abstract, the work performed under DOE Grant No. DE-FC26-04NT42130 during the period July, 2005 to June 2006 which covers the second performance year of the project is described and the major accomplishments are highlighted summarizing the most important research results. Presently work is in progress to characterize surface area, volume, mass, and density distributions for sized biomass particles. During this reporting period, Morehouse continued to obtain additional mean mass measurements for biomass particles employing the gravimetric technique measurement system that was set up in the last reporting period. Simultaneously, REM Engineering Services, our subcontractor, has obtained raw data for surface area (d_{sa}), volume (d_v), and drag coefficient to mass ratio (C_d/m) information for several biomass particles employing the electrodynamic balance (EDB) measurement system that was calibrated in the last reporting period. Preliminary results of the shape information (d_{sa} and d_v), particle C_d/m, mass (m), and density (ρ) information obtained for 16 individual biomass particles examined in this study will be presented. Weighing and counting of 23,443 biomass particles during this performance period yielded a mean mass per particle of 1.962×10^{-7} g. These experiments are currently being repeated on a statistically significant number of particles and the final results for mean mass and density will be reported in the future.

FUTURE WORK

Setting up, calibration, testing of the measurement systems with actual biomass particles have been completed to date. Data collection using these measurement systems are in progress, and preliminary results are reported above. This amounts to more than 65% of the proposed project work to date. Counting and weighing of several thousand more biomass particles to obtain mean mass per particle is planned and is anticipated to be completed in the next three months. Also, statistically significant number of individual biomass particles are being caught in the EDB and collection of raw data for their shape and mass is anticipated to be completed in the next three months. In other words, close to 100% of the data collection proposed in this project is anticipated to be completed by the end of the first quarter of the next reporting period. This would amount to completion of 75% of the proposed project by the end of the first quarter of the third performance year of the project. Remaining 25% of the project work including completion of data analysis and reporting is anticipated to be completed by the end of the third performance year of the project.

LIST OF PAPER PUBLISHED

R. Sampath, R. M. Dixon, M. D. Young, and G. Weirko-Brobby, Surface Area, Volume, Mass, and Density Distributions for Sized Biomass Particles, 2005 University Coal Research / Historically Blck Colleges and Universities and other Minority Institutions Contractors Review Meeting, sponsored by NETL/U.S. DOE, June 7-8, 2005, Pittsburgh, PA.

R. Sampath, C. S. Brown, M. Byars, and G. Saha, Surface Area, Volume, Mass, and Density Distributions for Sized Biomass Particles, 2005 University Coal Research / Historically Blck Colleges and Universities and other Minority Institutions Contractors Review Meeting, sponsored by NETL/U.S. DOE, June 6-7, 2005, Pittsburgh, PA.

STUDENTS SUPPORTED UNDER THIS RESEARCH

To date, a total of three undergraduate students (Michael D. Young, George Weirko-Brobby, and Malikah Byars), and one graduate student (Gautam Saha) are/were supported under this research.

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